

CLAIMS

1. A lightweight door for motor vehicles

comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy, wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay, with an inner and an outer window gutter profile (5, 6) which is made from light metal or a light metal alloy, said window gutter profile (5, 6) supplementing the U-shaped supporting frame (1);

wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, with the ends of the window gutter profiles (5, 6) being permanently connected to the hinge support (2) and the lock support (3);

comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy;

comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) in any case are permanently connected to the inner window gutter profile (5);

wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness.

2. The lightweight door according to claim 1, wherein a single-part outer skin (9) of the door is permanently connected to the supporting frame (1) and the outer window gutter profile (6).
3. The lightweight door according to claim 1, wherein the supporting frame (1) contributes to forming part of the inside skin (11) of the door.
4. The lightweight door according to claim 1, wherein the supporting frame 1 forms an area-shaped cross stay (1") which closes the basic U-shape and which is located opposite the door bottom (4).
5. The lightweight door according to claim 3, wherein the supporting frame (1) forms an area-shaped cross stay (1") which closes the basic U-shape and which is located opposite the door bottom (4).
6. The lightweight door according to claim 1, wherein the connection regions of the various structural members, namely the supporting frame (1), inner door gutter profile (5), lateral impact protection element (7) and window frame (8), spatially coincide so as to form structural frame gussets.
7. The lightweight door according to claim 1, wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique of the group press-riveting, bonding, welding.
8. The lightweight door according to claim 6, wherein, in the region of structural frame gussets, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said

5 supporting frame (1) by a connection technique of the group press-riveting, bonding, welding.

9. A lightweight door for motor vehicles

comprising an essentially U-shaped supporting frame (1) made from light metal or a light metal alloy,

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wherein said supporting frame (1) comprises: a hinge support (2) forming one U-limb, a lock support (3) forming the other U-limb and a door bottom (4) forming the U-stay,

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with an inner and an outer window gutter profile (5, 6) made from light metal or a light metal alloy, said window gutter profile (5, 6) supplementing the U-shaped supporting frame (1);

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wherein if the lightweight door is installed in a motor vehicle body, the window gutter profiles (5, 6) are essentially aligned in longitudinal direction of the vehicle, and the ends of the window gutter profiles (5, 6) are permanently connected to the hinge support (2) and the lock support (3);

20

comprising a lateral impact protection element (7) arranged in the supporting frame (1), with the ends of said impact protection element (7) being permanently connected to the supporting frame (1), wherein the lateral impact protection element (7) is an extruded profile made from light metal or a light metal alloy; comprising a window frame (8) made from light metal or a light metal alloy, wherein the ends of the window frame (8) in any case are permanently connected to the inner window gutter profile (5);

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wherein the supporting frame (1) is made in one piece as a pressed part or a deep-drawn part, from a metal sheet of minimum thickness;

wherein the supporting frame (1) contributes to form part of the inside skin (11) of the door; wherein the supporting frame (1) forms an area-shaped cross stay (1") which closes the basic U-shape and which is located opposite the door bottom (4); wherein the connection regions of the various structural members, namely the supporting frame (1), inner window gutter profile (5), lateral impact protection element (7) and window frame (8), spatially coincide so as to form structural frame gussets;

wherein, in more heavily loaded areas, reinforcement and connection sheets (11) are arranged on the supporting frame (1) and permanently connected to said supporting frame (1) by a connection technique of the group press-riveting, bonding, welding.

10. The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) are pressed parts or deep-drawn parts.
11. The lightweight door according to claim 7, wherein the reinforcement and connection sheets (11) in part form hollow chambers (12) with the supporting frame (1), in particular at the hinge support (2).
12. The lightweight door according to claim 1, wherein the inner window gutter profile (5) is a box-section extrusion profile.
13. The lightweight door according to claim 1, wherein the inner window gutter profile (5) is perfectly straight.

14. The lightweight door according to claim 1, wherein the ends of the lateral impact protection element (7) are permanently attached to the supporting frame (1) by means of brackets (14).
15. The lightweight door according to claim 1, wherein upper and lower hinge point strengthening plates (15), made from light metal or a light metal alloy, are permanently attached to the hinge support (2).
16. The lightweight door according to claim 15, wherein the lateral impact protection element (7) on a front side door is arranged so as to slope downward from the hinge support (2) to the lock support (3), or so as to be horizontal, and the free L-limb of the upper hinge point strengthening plate (15) is L-shaped and directly welded together with the end of the lateral impact protection element (7).
17. The lightweight door according to claim 15, wherein on a rear side door the lateral impact protection element (7) is arranged so as to be upward sloping or horizontal from the hinge support (2) to the lock support (3), and wherein the lower hinge point strengthening plate (15) is L-shaped, with its free L-limb being permanently connected to the lateral impact protection element (7).
18. The lightweight door according to claim 1, wherein the ends of the window frame (8) extend beyond the front and rear ends of the inner window gutter profile (5), where they are permanently connected to said window gutter profile (5).
19. The lightweight door according to claim 1, wherein the ends of the window frame (8) abut on top of the front and rear ends of the inner window gutter profile (5),

where they are permanently connected to said window gutter profile (5).

20. The lightweight door according to claim 1, wherein the window frame (8), on the side facing the lock support 3, is reinforced by an elongated frame reinforcement part (11d).
21. The lightweight door according to claim 20, wherein the frame reinforcement part (11d) is a pressed part or deep-drawn part made from light metal or a light metal alloy, said frame reinforcement part (11d) being connected to the window frame (8) by way of welding.
22. The lightweight door according to claim 21, wherein the frame reinforcement part (11d) is also welded to the outer window gutter profile (6).
23. The lightweight door according to claim 19, wherein an upper angular section (20) of the window frame (8) is integrated in the frame reinforcement part (11d).
24. The lightweight door according to claim 1, wherein a mirror triangle (22) is formed at the hinge support (2) or at the cross stay (1") on the top above the inner window gutter profile (5).
25. The lightweight door according to claim 24, wherein a mirror triangle (11c) is provided, designed as a reinforcement and connection sheet (11).
26. The lightweight door according to claim 1, claim 15 or claim 21, wherein the light metal is aluminium and the light metal alloy is an aluminium alloy.

27. The lightweight door according to claim 1, 2, 14, 15, 16, 17, 18 or 19, wherein the permanent connection has been established by welding.
28. The lightweight door according to claim 9, wherein the reinforcement and connection sheets (11) are pressed parts or deep-drawn parts.
29. The lightweight door according to claim 28, wherein the reinforcement and connections sheets (11) in part form hollow chambers (12) with the supporting frame (1), in particular at the hinge support (2).